Examples of Comparative Photographs of the Metallic and Solar Spectra. By F. McClean, M.A.

The photographs represent the spectra of Sections IV., V., and VI. of the Gold Group of Metals and of Section IV. of the Iron Group. These spectra are collated by means of their common air lines with the iron spectrum, and so by means of the iron lines with the solar spectrum.

The sections correspond with the divisions of Ångström's Chart. Section VI. extends to wave-length 5720 (a little short of D), which is as far towards the Red as the photographs can be, at present, satisfactorily obtained. The exposure requisite with the more refractory metals is something like sixty times as long as is necessary for photographs of the corresponding portions of the solar spectrum, although an extremely powerful induction spark is used.

These photographs are probably among those which offer the greatest difficulty in the series of metallic spectra now in hand, and as the undertaking is one requiring considerable time and labour, I wished meanwhile to bring these examples of the work before the Society.

The spectra of the metals appear to me to be fairly within the scope of astronomy, as our knowledge of them forms the basis of any knowledge we possess of the composition of the heavenly bodies.

The spectra of the Gold Group, as far as the photographs go, indicate many lines due to these metals not hitherto observed, and they also show some curious coincidences between the air lines in the metallic spectra and lines in the solar spectrum.

1891 *June* 11.

Observations of the Partial Solar Eclipse of 1891 *June* 6, *made at the Radcliffe Observatory, Oxford.*

(*Communicated by E. J. Stone, M.A., F.R.S.*)

The observations of first contact were lost owing to cloud. The last contact was satisfactorily observed.

Greenwich Mean Time. h	m	s	Observer.	Instrument.	Power.	Ref.
6	22	46·4	Wickham	Barclay, 10-inch	90	(*a*)
6	22	47·8	Robinson	Heliometer, $7\frac{1}{2}$-inch	140	(*b*)

(*a*) The time given is that of the last trace of the Moon's limb: phenomenon slow, limbs undulating, but observation good.

(*b*) The time noted is that of the final disappearance of the Moon's limb; observation considered very fair.

Radcliffe Observatory, Oxford:
1891 *June* 11.

Observations of the Transit of Mercury on 1891 May 9 at the Royal Observatory, Edinburgh.

(*Communicated by Ralph Copeland, Ph.D., Astronomer Royal for Scotland.*)

The sky was very clear in the neighbourhood of the Sun, and at a moderate elevation the definition was excellent as tested before the egress on *Jupiter*, and afterwards on various sun-spots. But at the very low altitude of *Mercury*, which was only 2° 44′ above the true horizon at internal contact, the case was far different. Examined with the 24-inch reflector, and a power of 138 on 4 inches of free aperture just clear of the diagonal mirror, the Sun's limb was deeply indented with slow, creeping undulations. Some of these indentations occasionally deformed the same point of the Sun's margin for a second or more at a time, giving it a kind of scolloped appearance. From comparisons with the planet's diameter, it was estimated that the larger of these indentations were fully 3″ deep. They differed very much in length, but 1′ may be taken as the average; some, however, were quite as short as 12″, and the crest of one of these short waves was seen to turn over for a second or so into a distinct hook almost enclosing a dark area not unlike the disc of the planet. The undulations seemed chiefly to move along the Sun's limb in the direction of decreasing position-angle, that is to say, downwards, the position-angle of the planet counted from the Sun's vertex being 223°.

As seen in the reflector, the Sun's limb appeared to be torn asunder rather suddenly by the planet's disc at $19^h\ 40^m\ 40^s$ sidereal clock time, but the outline of the Sun was so unsteady that for about a quarter of a minute it looked as if the Sun's limb might reunite at any moment; but this did not happen, and the above time was adopted as that of internal contact.

At external contact the Sun's limb was watched for 22^s after the recorded time, but no further trace of the planet was seen. The planet's true altitude at this contact was 3° 17′.

Mr. Heath observed with his own $3\frac{1}{2}$-inch Cooke achromatic, while Mr. A. J. Ramsay used the 3·7-inch Sheepshanks telescope, reduced in aperture, on a portable equatorial stand.

The observations, arranged in order of time, run as follows:—

	Edinburgh M.T. h m s	Effective Aperture. ins.	Power.	Observer.
Internal contact ...	16 28 50·1	4	138	R. C.
,, ...	16 28 58·1	$2\frac{7}{8}$	48	A. J. R.
Planet bisected ...	16 31 4·7	4	138	R. C.
,, ...	16 31 51·6	$3\frac{1}{2}$	120	T. H.
External contact ...	16 32 49·4*	$2\frac{7}{8}$	48	A. J. R.
,, ...	16 33 9·4	$3\frac{1}{2}$	120	T. H.
,, ...	16 33 42·3	4	138	R. C.

* Observer's Note: 'The last contact was estimated to have taken place when I could no longer distinguish between the undulations of the Sun's limb and the notch made by the disappearing planet.'